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CONTROL MECHANISM FOR CARBURETOR TYPE
INTERNAL-COMBUSTION ENGINES
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Fig.1

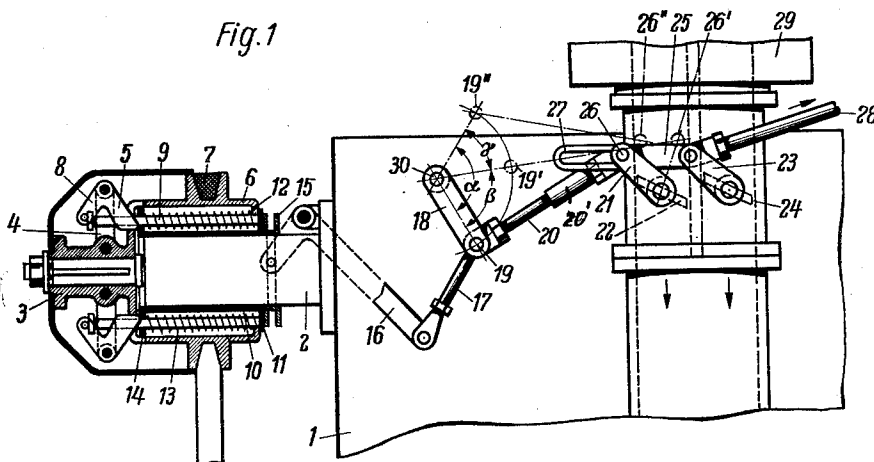
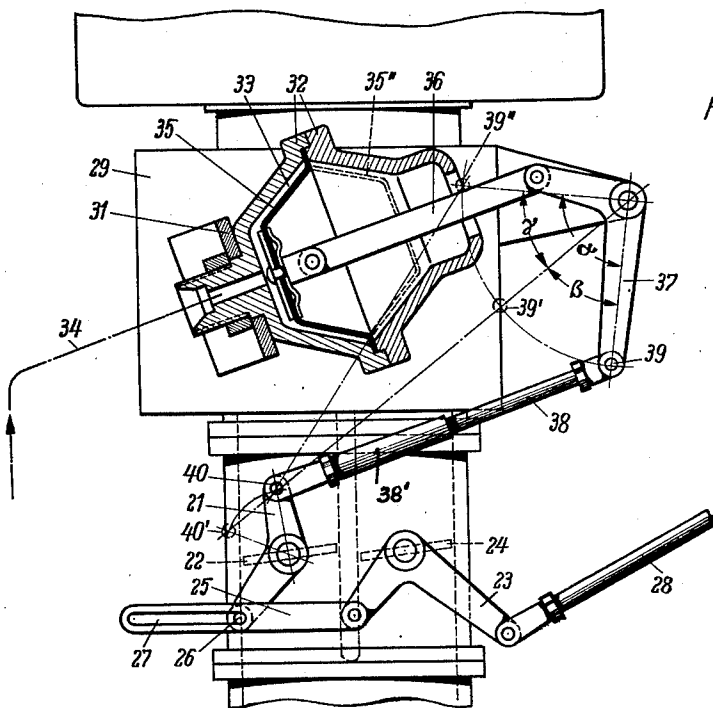


Fig. 2



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CONTROL MECHANISM FOR CARBURETOR
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This invention relates to a control mechanism for carburetor type internal combustion engines, for example, automobile engines. Objects of the present invention are primarily to provide an improvement in engine power, improved flexibility of control as load changes are made, better starting torque, high efficiency as well in the lower as in the upper range of engine loads and, eventually, security against over-running when exceeding a permissible top speed.

In order to obtain in carburetor type internal combustion engines a smooth transition as load changes are made, or when opening or closing the throttle, and to secure a good behavior of the engine at part load, it is suitable to keep the clear passage area for the air on the carburetor air funnel relatively narrow. However, such a proportioning has the disadvantage that, the higher the engine speed the lower becomes the volumetric efficiency. Already at intermediate speeds the power decreases, resulting at higher speeds in an essentially lower efficiency.

In contradistinction thereto a feature of the invention—particularly in order to remove these disadvantages—essentially consists therein that the passage area for the carburetor air is governed in dependence on the speed by means of a speed governor, particularly in a manner whereby, with increasing engine speed or when exceeding a predetermined speed, the passage area of the carburetor air is increased. Such a control is suitably obtained by providing an auxiliary carburetor in addition, for example, to a low proportioned main carburetor. This auxiliary carburetor is cut in, or essentially so, only when the engine exceeds a given speed. The auxiliary carburetor is preferably in parallel with the main carburetor and provided with a separate throttle valve. Cutting in may take place gradually or instantly at part-open or, if desired, wide-open throttle of the main carburetor. Preferably, the auxiliary carburetor is also cut out at part load (entirely or partly) at all engine speeds, conversely, at full load only in the lower speed range.

A further feature of the invention consists therein that, when a definite upper limit speed is exceeded, the passage area of the carburetor is reduced, or still further reduced, particularly in such a manner that the auxiliary carburetor, being in parallel with the main carburetor, is gradually or instantly, entirely or partly cut out when the upper limit speed is exceeded. Simultaneously the speed governor may, as the upper limit speed is exceeded, also affect the main carburetor in a manner whereby the same is partly

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or entirely cut out. In the simplest way this cutting out may be accomplished thereby that a lever, linked to the control linkage, is, with respect to the carburetor control member, adjusted beyond the dead-center position. Thus the carburetor throttle may be actuated by the linkage first to open and thereafter to close. By interposing suitable play the movement of the control linkage may also affect the throttle of the main carburetor.

The application of such a control prevents the engine from reaching a speed above a permissible number of revolutions since it throttles down or stops the engine as soon as the permissible speed is exceeded.

In the accompanying drawing two forms of carburetor control mechanisms, in which the invention is embodied, are illustrated by way of example, and

Fig. 1 illustrates a carburetor control mechanism with mechanical centrifugal governor, and Fig. 2 a carburetor control mechanism with hydraulic governor.

In Fig. 1 rigidly secured to the engine 1 is a shaft 2 on which the rotor 3 of a centrifugal type speed governor is rotatably mounted, which on support arms 4 carries fly weights 5. The speed governor with its optionally two-piece, housing-like part 6 is driven by the crank or camshaft or by any other suitable rotating part of the engine by means of a V-belt 7. The control arms 8 of the fly weights 5 act upon governor pins 9 which are shiftably supported in the housing-like part 6. Mounted on the shaft 2 is a governor sleeve 10 whose collar-like right-hand end 11 embraces the flange 12 of the housing 6 on the outside. Springs 13 surround the pins 9 and are supported on one side against the flange 12 and on the other side against the collar-like left-hand end 14 of the governor sleeve 10, so as to cause the latter together with the governor pins 9 to be forced towards the left against the action of the fly weights 5. A control sleeve 15 is either rigidly or non-positively connected with the pins 9 or sleeve 10. At low speed (the fly weights 5 being still at rest) this sleeve 15 is in the left-hand end position illustrated in Fig. 1, however, as the weights 5 are moved by the centrifugal force it is gradually moved towards the right.

The movement of the control sleeve 15 is transmitted by means of a bell-crank 16 and a rod 17 to a lever 18 which in turn, by means of a rod 20 connected to the joint 19, and which may be longitudinally adjustable, transmits the movement

to the lever 21 of the throttle 22 of the auxiliary carburetor. The lever 21 is connected with the lever 23 of the throttle 24 of the main carburetor by means of a strap 25 which embraces the pin 26 with lost motion in the form of a longitudinal slot 27. The lever 23 for the throttle of the main carburetor is operated in the usual manner through a rod 28, for example, by depressing the accelerator pedal.

The double carburetor 29 is, for example, developed as down-draft carburetor. Each of the throttles 22, 24 is situated in a separate air passage, each of them being provided with a separate fuel jet and eventually separate float housing.

In the drawing, the governor and control linkages are illustrated in their respective position with released accelerator pedal (that is no-load) and at low speed. As the accelerator pedal is depressed, for example, against the action of a conventional release spring, and the rod 28 accordingly moved in the direction of the arrow, the throttle 24 of the main carburetor opens, whereas the throttle 22 of the auxiliary carburetor remains closed, since the strap 25, according to the lost motion 27, can move towards the right until the throttle 24 is wide open or nearly wide open without carrying along the pin 26 of the lever 21. If desired, more or less shortly before the throttle 24 is wide open, a partial opening of the throttle 22 may also take place by causing the pin 26 to be carried along in the slot 27. The slot, in this case, may be proportioned substantially shorter than shown in the drawing.

As the engine speed increases and the fly weights 5 swing outward, their movement is transmitted through the pins 9 and links 15, 16, 17, 18, 19, 20 to the lever 21 of the throttle 22 of the auxiliary carburetor. In the course of this movement, the lever 18 can swing in a total angle of the magnitude α which is composed of an angle β and an angle γ . After moving as far as β , the joint 19 is situated at a point 19' which lies on the straight-line connecting the fixed fulcrum point 30 of the lever 18 and the joint 26 in the position 26' of the latter. In this position the throttle 22 is wide open, the engine has reached its maximum permissible speed. The throttle 24 of the main carburetor is in a position corresponding to the position of the accelerator pedal, and it is, therefore, also wide open.

If, however, the latter is not the case and, therefore, the throttle 24, for example, only partly open, then the governor force and the spring force of the accelerator pedal can be matched in such a manner that the governor cannot overcome the pressure of the release spring of the accelerator pedal and is therewith rendered ineffective for no-load or part load, or can only become effective to an extent corresponding to the lost motion for the pin 26 as released by the links 28, 25.

As the engine speed exceeds the limit determined by the position 19' of the lever 18 (the fly weights being swung further out), the joint 19 is moved beyond the dead-center position 19' into the position 19'' with the result that the joint 26 returns into the position 26'' and the throttle 22 of the auxiliary carburetor is again partly (or, eventually, also entirely) closed. Inasmuch as the throttle 24 of the main carburetor has likewise been open it may in this case, for example, with a correspondingly shorter slot 27, likewise be carried along in closing direction by the strap 25. A spring, permitting such movement, may

be interposed between accelerator pedal and rod 28.

In Fig. 2 the control of the throttle 22 of the auxiliary carburetor, or of both carburetors 22 and 24, depends upon the action of a hydraulic type speed governor. The latter consists of a two-part housing 32 fastened, for example, to the carburetor 29 by means of a bracket 31. The interior of the housing 32 is in communication with the water pump of the cooling water circulation system of the engine through a line 34 and provided with a diaphragm 35 actuated by the pressure of the cooling water. The pressure exerted by the diaphragm is transmitted through a link 36 to a bell-crank 37 and thence via a rod 38, which may be longitudinally adjustable to the lever 21 of the carburetor 22. At low engine speed, the diaphragm 35 is located—either due to its own elasticity or owing to the action of a separate spring counteracting the pressure of the cooling water—in the left-hand end position shown in the drawing, in which position the throttle 22 is closed.

With rising engine speed and consequently rising cooling water pressure, the diaphragm 35 is pushed beyond its intermediate position up to its right-hand end position. As an intermediate speed is reached by the engine (corresponding to an intermediate position of the diaphragm 35 and a movement covering angle β of the bell-crank 37) the joint 39 between the lever 37 and the rod 38 is moved in turn into a dead-center position 39' which corresponds to the wide-open throttle 22. At a further movement, covering angle γ , up to the end position 39'' of the joint 39, the throttle 22 and, if desired, also the throttle 24 are operated in closing direction in order to prevent over-running of the engine. In other respects the same principles are applicable as in the embodiment according to Fig. 1.

If desired, the connection between the throttle of the auxiliary carburetor and the throttle of the main carburetor, by means of the strap 25 or the like, may be omitted. In this case, as the permissible speed is exceeded, a reduction in power or speed is solely obtained by cutting out the auxiliary carburetor. The air passage area of the main and auxiliary carburetors may, as in the illustrated embodiments, be equally large, or also variously proportioned. The air passage area of the main carburetor, for example, operated by the accelerator pedal, may as well be smaller or larger than that of the auxiliary carburetor. Main and auxiliary throttles may also, by way of example, be arranged on a joint fulcrum point, in which case the coupling between both throttles may be accomplished either on the throttle shaft itself, or also outside on the linkage. Instead of a mechanical or hydraulic type speed governor, a pneumatic type speed governor or the like may be provided for. The hydraulic speed governor may also be actuated, by way of example, instead of by cooling water pressure by the pressure, of the lubricating oil, or by means of another liquid circulated by the engine.

In contrast to the mechanical control, the hydraulic control generally is such that the pressure of the liquid, and therefore fundamentally also the actuating stroke, increases relatively slowly in the lower speed range and relatively fast in the upper speed range. Such a control is, circumstances permitting, especially suitable, since thereby a quick cut out is rendered possible as the permissible speed is exceeded.

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Furthermore, it may prove to be especially suitable to arrange the speed governor on the vertical shaft of the distributor or the ignition system of the engine and have it driven by this shaft.

As already stated, the rod 20 of Figure 1 or 38 of Figure 2 may be longitudinally adjustable, in which case it comprises two telescoping parts 20 and 20' or 38 and 38', whereby the length of the rod may be varied within desired limits.

It will be obvious to those skilled in the art that the details of construction may be varied from those shown and yet the essentials of the invention be retained. I therefore do not limit myself to such details.

What I claim is:

1. In an internal combustion engine, two carburetion devices essentially in parallel, comprising: a main and an auxiliary carburetor, a control member for the air passage area of the main carburetor, a control member for the air passage area of the auxiliary carburetor, a speed governor depending for its action upon a change in engine speed, a transmission mechanism for actuating the control member of said auxiliary carburetor by means of said speed governor, and a lost motion coupling member between said control mechanism of said main carburetor and that of said auxiliary carburetor, said transmission mechanism and said lost motion coupling mechanism being adapted to enable said speed governor, at substantially wide-open air passage area of said main carburetor, to govern the control member of said auxiliary carburetor substantially over the entire range of speed control, and wherein at fully closed air passage area of said main carburetor the actuation of the control member of said auxiliary carburetor by said speed governor is inhibited.

2. In an internal combustion engine, a main carburetor, an auxiliary carburetor, a speed governor depending for its action upon a change in engine speed of said internal combustion engine, a control mechanism for said main carburetor operable by exterior forces, a control mechanism for said auxiliary carburetor, a transmission linkage between said speed governor and said control mechanism of said auxiliary carburetor, and a coupling linkage between both of said control mechanisms including a lost motion whereby, with the control mechanism of said main carburetor adjusted to full load, said speed governor is enabled to operate the control mechanism of said auxiliary carburetor over the entire range of speed control, and conversely, with the control mechanism of said main carburetor adjusted to no-load, said speed governor is prevented from affecting the control mechanism of said auxiliary carburetor.

3. In an internal combustion engine, the combination according to claim 2 in combination with an operating linkage for the control mechanism of said main carburetor whereby said control mechanism of said main carburetor may be adjusted to decreased load by means of said operating linkage, at low speeds of the internal combustion engine substantially unhindered by said speed governor, and conversely, at higher engine speeds only against the action of said speed governor.

4. In an internal combustion engine, a main carburetor, an auxiliary carburetor, a control mechanism for said main carburetor, a control mechanism for said auxiliary carburetor, a speed governor depending for its action upon a change

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in engine speed, a transmission linkage affecting said control mechanism of said auxiliary carburetor by means of said speed governor, comprising: an intermediate lever and a linkage member connected thereto being arranged and connected in such a manner that, as said speed governor comes into action with rising engine speed, said intermediate lever and said linkage member connected thereto are caused to move toward and past their reciprocal dead-center position and thereby effect a movement of the control mechanism of said auxiliary carburetor at first increasing said air passage area during the movement toward said dead center position and thereafter decreasing said passage area during movement past said dead center, and a coupling linkage including a lost motion between the control mechanism for said auxiliary carburetor and the control mechanism for said main carburetor enabling said transmission linkage, with said main carburetor adjusted to full load, to make its movement past the dead-center position independent of said control, and conversely, with said main carburetor adjusted to decreased load, being prevented from carrying out said movement.

5. In an internal combustion engine, the combination according to claim 2 including, means for adjusting said transmission mechanism between said speed governor and said control mechanism of said auxiliary carburetor.

6. In an internal combustion engine, the combination which comprises two carburetion devices in parallel, one control member each for controlling the passage area for the carburetor air of each device, the control member of at least one of said carburetion devices being operable from outside, a speed governor depending for its action upon a change in engine speed, and a transmission mechanism for actuating the control mechanism of at least the other of said carburetion devices in response to the action of said speed governor, and wherein said speed governor and said transmission mechanism are adapted to influence one of said carburetion devices in such a manner that said air passage area of said one carburetion device is decreased when a definite top speed is exceeded.

7. In an internal combustion engine, the combination which comprises two carburetion devices in parallel, one control member each for controlling the passage area for the carburetor air of each device, the control member of at least one of said carburetion devices being operable from outside, a speed governor depending for its action upon a change in engine speed, and a transmission mechanism for actuating the control mechanism of at least the other of said carburetion devices in response to the action of said speed governor, and wherein said speed governor and said transmission mechanism are adapted to influence said other carburetion device in such manner that with rising speed said air passage area is first increased and thereafter decreased when a definite top speed is exceeded.

8. In an internal combustion engine, the combination which comprises two carburetion devices in parallel, one control member each for controlling the passage area for the carburetor air of each device, the control member of at least one of said carburetion devices being operable from outside, a speed governor depending for its action upon a change in engine speed, and a transmission mechanism for actuating the control mechanism of at least the other of said car-

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buretion devices in response to the action of said speed governor, said transmission mechanism being so constructed and connected to said speed governor and carburetion devices that to some extent said speed governor also actuates the control member of said one device within a portion only of the actuation range of said other device.

9. In an internal combustion engine, the combination which comprises two carburetion devices in parallel, one control member each for controlling the passage area for the carburetor air of each device, the control member of at least one of said carburetion devices being operable from outside, a speed governor depending for its action upon a change in engine speed, and a transmission mechanism for actuating the control mechanism of at least the other of said carbure-

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tion devices in response to the action of said speed governor, said transmission mechanism being so constructed that, when a definite speed is exceeded, said air passage area of the other of said carburetion devices is also reduced, at least at wide-open air passage area.

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